

Organic LED using Alq₃/α-NPD superlattice structure

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Abstract

Fabrication of multilayered heterosturctures is one of the novel approaches for new functional optoelectronic devices. Unique optical properties were observed in superlattice structures of 8-hydroxyquinoline aluminum (Alq₃) and aromatic diamine (TPD) [1]. In this paper, an attempt is made to fabricate a heterostructure, where both electrons and holes are confined in well layers sandwiched by barrier layers of organic material capable of EL. Fig. 1. shows how individual levels corresponding to the top and bottom of a subband in a superlattice with multiple quantum wells separated by potential barriers, are split into minibands when the potential wells are brought closer to each other [2].

For this purpose, we fabricated organic electroluminescence superlattice device based on a periodic structure of alternating layers of Alq₃ and N,N-Di(naphthalene-1-yl)-N,N'-diphenylbenzidine (α-NPD). They were thermally deposited at a base pressure of 5×10⁻⁶ torr with a deposition rate of 0.5~1Å/sec. The thickness of Alq₃ and α-NPD is 2nm respectively. EL emission intensity and spectra were measured and X-ray photo spectroscopy (XPS) analysis was performed.

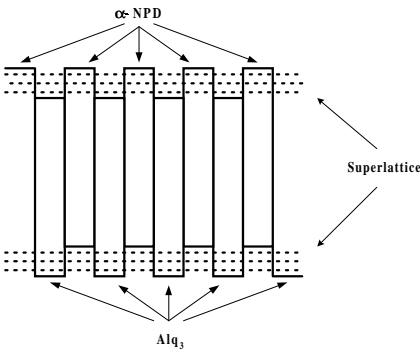


Fig. 1. Formation of

minibands in superlattice with small separation between quantum wells.

References

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[2] M. Shur, Physics of semiconductor devices, 597-599 (1990).